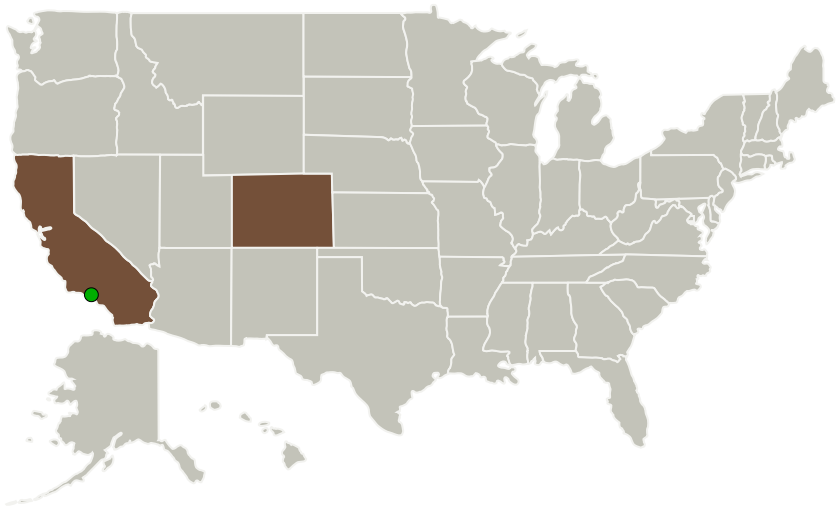
Towards Miniaturization of Instrumentation for In-Situ Organic Detection: Hands-Off PicoTOF

Completed Technology Project (2015 - 2017)

Project Introduction

We propose to develop and test a new ambient-pressure picosecond laser ionization time-of-flight mass spectrometer (PicoTOF) for sensitive analysis of surface organic composition on Mars and on other bodies in our solar system without the need for drilling, fetching, or transferring the sample. By taking advantage of time and space domains in independent laser ablation (leading to neutral plumes) and multiphoton ionization (away from the source and within a differentially pumped stage), and aided by reflectron time-of-flight mass spectrometry, this instrument will be uniquely poised to directly interrogate planetary surfaces at their ambient pressures with increased sensitivities compared to traditional laser ablation mass spectrometers. The PicoTOF — starting at TRL 2 and ending at TRL 3 — will lay foundation for development of a miniature flash-light size (~10" x 3") PicoTOF instrument in the future at higher TRL. PicoTOF will be a state-of-the-art instrument for rapid detection of organics in a variety of samples such as ices and minerals covering a mass range of at least 1-1000 m/z (amu) with a mass resolution of better than 500 (m/μm) aimed at missions to Mars, comets, asteroids, and the outer solar system.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Planetary Instrument Concepts for the Advancement of Solar System Observations

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Primary U.S. Work Locations	
California	Colorado

Project Management

Program Director:

Carolyn R Mercer

Program Manager:

Haris Riris

Principal Investigator:

Murthy S Gudipati

Co-Investigators:

Karen R Piggee
Bryana L Henderson
Sascha Kempf

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.2 Atomic and Molecular Species Assessment

Target Destination

Others Inside the Solar System